

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 30, 2009 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 35-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Sakaki (US Patent no. 6,875,333).

With regard to claim 35, Sakaki discloses a plating apparatus (col. 1, lines 7-8) comprising: a plating tank (10) for holding a plating solution (col. 7, lines 21-24); and a stirring mechanism (40, figure 1) having a plurality of stirring vanes (41, 80) immersed in the plating solution in the plating tank for stirring the plating solution (col. 10, lines 1-22); wherein the stirring vane (41) comprises a plurality of stirring vanes which are

actuatable by respective independent drive mechanisms (col. 2, lines 37-40; col. 11, lines 52-54; col. 12, lines 41-53), wherein respective edges of the vanes (41 and 80) are aligned with each other to keep stirring surfaces of the vanes in alignment with each other as shown in figure 7.

With regard to claim 36, the stirring vanes of Sakaki may be different in shape (bar-like or L-shaped; col. 2, lines 55-65; col. 11, lines 52-54) .

With regard to claim 37, Sakaki discloses wherein the stirring vanes (41) are reciprocally movable in directions parallel to a surface to be plated of a work piece (abstract; col. 2, lines 55-65).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 22-25, 27, 28, 30, 31 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US Patent Application Publication no. 2002/0153246) in view of Mizuki (EP 1 167583).

With regard to claims 22 and 40, Wang discloses an electrolytic apparatus (page 1, paragraph 3) comprising: a plating tank (100, see figure 7B) for holding a plating solution (34); a holder (29) for holding a workpiece (31) and bringing a surface to be plated of the workpiece (31) into contact with the plating solution (34) in the plating tank (100); and a nozzle pipe disposed in the plating tank (100) and having a plurality of plating solution injection nozzles (from the Liquid Mass Flow Controllers (LMFC) 21, 22, and 23 to inlets 8, 6, and 4, respectively) for injecting the plating solution (34) toward the surface to be plated of the work piece (31) held by the holder (29) to supply the plating solution (34) into the plating tank (100, see figure 7B) but fails to teach wherein the nozzle pipe is ring shaped being located in the plating tank so as to be immersed in the plating solution and is shaped to extend along an outer profile of the workpiece.

Mizuki discloses a plating method and apparatus comprising a vessel (361) containing a plating solution and a cleaning liquid (see figure 26; page 16, paragraph 111) wherein ring shaped nozzles (343) may be immersed in the tank (361), wherein the injection nozzles (343) are spaced apart along an axis of the pipe (figure 26), and the ring shaped nozzle structure extends along an outer profile of the workpiece (W) in order to improve the uniform electrodeposition property. Therefore, one having ordinary

skill in the art at the time of the invention would have found it obvious to modify the plating device of Wang, as taught by Mizuki, in order to improve the uniform electrodeposition property of the device.

With regard to claim 23, Wang discloses all of the structure, as applied to claim 22 above, but fails to explicitly disclose wherein streams of the plating solution (34) injected from the plating solution injection nozzles intersect each other on or in front of a substantially central area of the surface to be plated of the workpiece (31) held by the holder (29). However, Wang does disclose wherein the plating solution injection nozzles are movable relative to the work piece (31) held by the holder (29; page 15, paragraphs 272 and 282; figures 32A-32D, and 54B). Therefore, one having ordinary skill in the art at the time of the invention would have found it obvious to move the stream of the plating solution in front of the central area of the surface of the workpiece to be plated in order to obtain a more uniform thickness distribution through the substrate's surface as it is well known in the art.

With regard to claim 24, Wang further discloses wherein the plating apparatus (100) comprises has at least one anode (1, 2, and 3; see figure 7B), and a plating voltage is applied between the anode (1, 2, and 3) and the workpiece (31) to perform electroplating on the work piece through the power supplies (13, 12, and 11, respectively; page 6, paragraph 123).

With regard to claim 25, the electrolytic apparatus of Wang comprises a plating solution injection nozzle (254; see figure 35A) for injecting the plating solution (34)

toward the anode (1, 2, and 3) to supply the plating solution (34) into the plating tank (100).

With regard to claims 27 and 28, the workpiece (31) of Wang may be disposed horizontally as shown in figure 7B as well as vertically (page 16, paragraph 284).

With regard to claim 30, the nozzle pipe (from the Liquid Mass Flow Controllers (LMFC) 21, 22, and 23 to inlets 8, 6, and 4, respectively) of Wang is shaped to extend along an outer profile of the work piece (31; figures 7B, 13B) and is movable relatively to the work piece (31) held by the holder (29; page 15, paragraph 282; figures 32A-32D).

With regard to claim 31, the housing of the plating solution injection nozzles of Wang may be made of an electrically insulating material (page 15, paragraph 282).

7. Claims 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oberlittner et al. (US Patent no. 7,294,244).

With regard to claims 32 and 33, Oberlittner discloses an apparatus for processing a work piece (col.3, lines36-38), comprising: a plating tank (28, see figures 5 and 6) for holding a plating solution (col. 7, lines 41-44); and a stirring mechanism/paddle assembly (40, figure 4) having a stirring vane/paddle (132) immersed in the plating solution in the plating tank and disposed in a position facing a surface to be plated of a work piece (138; col. 12, lines 33-40), the stirring vane/paddle (132) being reciprocally movable parallel to the surface to be plated of the work piece

(138) to stir the plating solution (col. 13, lines 52-61). Even though Oberltnr does not explicitly disclose wherein the irregularities comprise a succession of triangular or rectangular saw-tooth irregularities, Oberltnr teaches wherein the stirring vane/paddle (132) has irregularities on at least one side thereof, the irregularities comprise a number of narrow grooves (150) defined at predetermined intervals and faces the surface to be plated of the work piece (figures 18-19; col. 12, lines 50-60)it has been held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. *In re Rose* , 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *In Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984). Also see MPEP 2144.

8. Claims 22, 26 and 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oberltnr.

With regard to claim 22, Oberltnr discloses an apparatus for processing a work piece (col.3, lines 36-38), comprising: a plating tank (28, see figures 5 and 6) for holding a plating solution (col. 7, lines 41-44); a holder/head assembly (42) for holding a workpiece (138) and bringing a surface to be plated of the workpiece (138) into contact with the plating solution (col. 9, lines 55-59) in the plating tank (28); and a ring-shaped nozzle pipe disposed in the plating tank (28) and having a plating solution injection

nozzle (57, see figure 6) for injecting the plating solution toward the surface to be plated of the work piece (138) held by the holder (42) to supply the plating solution into the plating tank (28; col. 9, lines 22-31). Even though Oberlitner discloses having a single inlet nozzle instead of a plurality, it has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). It would have been obvious to one having ordinary skill in the art at the time of the invention to add more injection nozzles to the assembly of Oberlitner in order to enable the whole area of a target plating surface of a wafer to be subjected to more uniform plating treatment and moreover, to enable a target plating surface of a wider area to be subjected to a positive and uniform plating treatment as it is well known in the art.

With regard to claim 26, Oberlitner discloses wherein other processes which would be also suitable for use with the expanded capabilities of the paddle (132) include electroplating and electroless plating, among others (col. 19, lines 35-38)

With regard to claim 34, Oberlitner discloses all of the features as applied to claim 32 above, but fails to teach wherein the stirring mechanism/paddle assembly (40) has a plurality of the stirring vanes. It has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). It would have been obvious to one having ordinary skill in the art at the time of the invention to add more paddles to the assembly of Oberlitner in order to enable the whole area of a target plating surface of a wafer to be subjected to more uniform plating treatment and moreover, to enable a target

plating surface of a wider area to be subjected to a positive and uniform plating treatment as it is well known in the art.

Allowable Subject Matter

9. Claims 38 and 39 are allowed.
10. The following is an examiner's statement of reasons for allowance: the claimed invention requires a plating apparatus comprising a plating tank for holding a plating solution, a stirring mechanism having a stirring vane for immersing in the plating solution and facing the workpiece surface, the stirring vane being mounted on a rotational shaft and reciprocally moveable parallel to the surface of the workpiece wherein the vane is oriented such that a plane of the stirring vane forms an angle, and varies the angle with respect to a plane perpendicular to the surface of the workpiece, as the stirring vane reciprocally moves by angular movement of the rotational shaft about the longitudinal axis of the rotational shaft.

The closest Prior Art discloses a plating apparatus comprising a plating tank for holding a plating solution; and a stirring mechanism having a stirring vane immersed in the plating solution in the plating tank wherein the stirring vane comprises a plurality of stirring vanes and disposed in a position facing a surface to be plated of a work piece the stirring vane being reciprocally movable parallel to the surface to be plated of the workpiece to stir the plating solution; wherein the stirring vane is operable to form an angle with respect to the surface the work piece which is variable as the stirring vane reciprocally moves but fails to teach wherein such stirring vane forms an angle with

respect to a plane perpendicular to the surface of the workpiece and wherein such angle varies by an angular movement of the rotational shaft about the longitudinal axis of the rotational shaft. There was no teaching in the Prior Art suggesting modification of the conventional apparatus to obtain the stirring mechanism of the present invention.

11. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

12. Applicant's arguments filed on September 30, 2009 have been fully considered but they are not persuasive. The applicant argues that Sakaki fails to teach stirring vanes having an independent drive source. In response, the examiner does not find this argument persuasive because Sakaki discloses wherein a first inner ring (61) rotates a pedestal (51) of the first stirrer (40) and a second inner ring (91) rotates a second stirrer (80) on the side below a diaphragm (70) and has two outer rings (62 and 92), to which driving shafts (12a and 12b) are connected, corresponding respectively to the inner rings (61 and 91; col. 12, lines 41-53). Therefore, Sakaki does teach wherein the stirring vanes are actuatable by respective independent drive mechanisms.

13. Applicant's arguments with respect to claim 22 have been considered but are moot in view of the new ground(s) of rejection. Applicant argues that the Prior Art of

record fails to teach "...a ring-shaped nozzle pipe in the plating tank so as to be immersed in the plating solution..., the nozzle pipe being shaped to extend along an outer profile of the workpiece...", as amended.

14. Applicant's arguments, see page 9 of Remarks, filed on September 14, 2009, with respect to claim 38 have been fully considered and are persuasive. The applicant argues that the Prior Art of record fails to teach the orientation of a stirring vane relative to a plane perpendicular to the surface of the workpiece and wherein the stirring mechanism is operable to vary the angle of the plane of the stirring vane by angular movement of the rotational shaft about the longitudinal axis of the rotational shaft, as amended. Therefore, the rejections of claims 38 and 39 have been withdrawn.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ZULMARIAM MENDEZ whose telephone number is (571)272-9805. The examiner can normally be reached on Monday-Friday from 9am to 5pm.

16. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Michener can be reached on 571-272-1424. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

17. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry D Wilkins, III/
Primary Examiner, Art Unit 1795

/Z. M./
Examiner, Art Unit 1795